

Castlemaine Naturalist

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Aftermath of the Daylesford bushfire
Photo Noel Young

Climate change – a geological viewpoint

The prevailing view of “climate scientists” is generally (and somewhat conservatively) represented by the IPCC organisation. I put climate scientists in quotes because the IPCC contributors are in fact scientists from a wide array of disciplines, such as atmospheric physicists, chemists and microbiologists, and include many specialists such as glaciologists oceanographers and meteorological modellers. Some are geologists, usually specialising in palaeoclimatology, but with climate researchers now numbering in the thousands, no one discipline seems to have a controlling influence. This reflects the extreme complexity of the topic, requiring co-operation and understanding across many disciplines.

The “ozone hole” problem in the late 80s led to the realisation that human activity could have a dangerous impact on the atmosphere, and it was noted that the many signs of global warming coincided with a considerable increase in carbon dioxide in the atmosphere since the industrial revolution. The urgency of the need to know what is likely to happen, and what if anything we can do about it, led to this almost unprecedented multi-disciplinary co-operation in the world of science.

Outside of this juggernaut, there are geologists who feel that the earth's historical record indicates a different scenario from that which the IPCC with its necessary emphasis on the biosphere, is currently pursuing. Dr Julian Hollis asks us to keep an open mind on whether the world is in fact warming, or perhaps showing signs of wild fluctuations that herald the return to ice age conditions.

In his presentation at our last meeting, he began by outlining the geological history of the earth, of which evidence reaches back as far as four billion years, and a scaled wall column about 2m long showed the known duration of Homo sapiens as about the thickness of a pencil line at the top. And throughout the long history revealed by rock strata, there is clear evidence of many radical changes in the conditions on our planet. It is very difficult to get your head around “big picture” extremes – like the size of atomic particles, the distance to

the far galaxies, the number of stars and the age of the planet. Getting things in perspective is, perhaps, just as difficult. While life in its varying forms has survived extremes of climatic variation through most of geological history, a highly developed life-form such as ourselves seems very vulnerable in the face of such changes. Life itself is surprisingly tough, but the geological record is littered with mass extinctions of species.

One of the more obvious records of climate change is evidence of ice ages past. A major driver of the ice age cycles appears to be the cyclical variations in the earth's orbit, precession, and axial tilt known as Milankovitch cycles, but some variations must be due to other less predictable causes, like albedo "feedback", or changes in the ocean currents which are strong climatic drivers.

Currently we are in an Ice age interglacial period. The record indicates that interglacials (occasional relatively stable warm periods of which ours is the 7th or 8th in this ice age) typically last about 10,000 years. This places our time near the end of this interglacial, so we should be expecting a return to an icy world from whence we evolved in limited numbers until around 8,000 years ago when the balmy climate led to the flourishing of humanity.

Because of the destructive geological activity over time (plate tectonics etc.) the geological record is more piecemeal with age, and more difficult to accurately date, so that detail can only be expected from more recent deposits. Although not really new, palaeoclimatology has rapidly advanced since the early 90s under the influence of the IPCC. The aim is to find ways to detail climate changes of the more recent past, preferably down to annual sampling levels. Sedimentary "varves" (visible seasonal changes) have been known for a long time, as has the phenomena of tree rings, which can be counted back from present or a known date. But perhaps the most interesting development of the last decade has been the recovery of continuous ice cores through the ice caps of Greenland and Antarctica which have accumulated through the current ice age, the latter containing information over about 750,000 years. The ice contains bubbles of trapped air, and techniques have been developed to read the gas composition of these, and the isotope ratio of oxygen which indirectly gives a measure of regional temperature.

Julian described the characteristics of glacial and interglacial strata. The present interglacial began around 14,000 years ago and the ice cores show that it was severely interrupted by the "Younger Dryas" cold period which ended even more suddenly in Greenland about 11,500 years ago, when the temperature rose 10° C in a decade! A similar but shorter episode occurred later, known as the "8.2ka event", before a stable warm climate settled in to continue to the present. However, while illustrating that catastrophic climate change has occurred, both these events are thought to be the result of the sudden release of huge melt water lakes with the thawing of the ice sheets, leading to temporary changes in ocean conveyor currents, and affecting mainly the northern hemisphere.

More recent research has concentrated on the identification of pollens and spores in well preserved sediments of lake and pond beds (palynology). Plant types generally are good indicators of local climate.

Recorded history reveals some major climate changes. A Greco-Roman warm period was followed by a reversion to cold climate around the 3rd C ad. Warming again occurs in the 11th C, and the "Little Ice Age" occurs in the early 17th C. These events are backed by palynology and ice core evidence.

Julian then sketched some local examples of climate change evidence in fairly recent geological times -

1. Lake Bullen Merri (Camperdown) preserves 17000 years of sedimentation. Analysis shows an extended dry climate followed by a wet period around 1740. Lake levels are now the lowest in 10,000 years.
2. Lunettes (dunes formed leeward of dry lake beds) are physiographic evidence of prolonged drought.
3. A sequence in a river bank at Blue Gully near Daylesford. Bedded sediments indicating a wet environment are capped by a black horizon full of charcoal or charred timber indicative of intense wild fire like the 2003 fires in the high country where the soil was burnt to 10-15cm deep, killing roots and seeds. Ominously, the strata above this band are wind blown sediments indicative of a dry glacial climate.
4. Severe drought in the Murray Darling basin was worse than the present in the 19th C. when bushfires coincided with the dry rivers. In 1851, on February 6th, bushfires burned 5 million Ha. and the temperature in Melbourne was 47-48° C on the day!

On the excursion the following day, Julian took us to the Stony Creek basin (Daylesford), the site of a recent sedimentary sequence in the floor of a small lake trapped by volcanic activity about 2 mya. A sequence of soft mudstone with abundant pollen and spores slowly accumulated, and a vertical sequence of 20m was sampled at close intervals and dated from 1.9 to 1.4 mya. The palynological study was published in the Proceedings of the Royal Society of Victoria in 2004, and shows numerous substantial changes in vegetation which reflect rapid fluctuations in climate. The sampling intervals represent about 100 years, and variations in this time frame occur from sub tropical to cool temperate types similar to New Zealand's south island or Tasmania. These swings are thought to be a feature of the early part of the Pleistocene Ice Age.

Julian Hollis takes the view that the natural forces of climate instability are much stronger than anything that pollution could contribute, and that we should concentrate on adaptation to climate change. He asks the question does CO₂ cause warming, or is CO₂ merely following temperature? (even though the climate scientists are these days quite adamant that it is a potent "forcing agent"). He also questions the methodology (admittedly complex and difficult) of measuring and calculating a global average temperature.

All this I find fascinating, but it raises more questions than answers. How relevant is the geological record to the global warming evidence of the last half century? If global temperature rise is a myth, how do we account for glacier recession all over the globe for the last 200 years, and now rapid melting of ice at both poles? And a list of different methodologies by the IPCC all of which show an anomalous

warming trend. How much of the palynological evidence for rapid vegetation changes is regional rather than global? Indeed, separating local from global effects is a problem with much of the evidence from the past. The ice core assays proved that the Milankovitch cycles were the primary controllers of the climate changes for at least half a million years, but not the current rapid warming.

From my reading of the subject, the climate scientists don't have a problem with the geological evidence. They simply believe that the physics of greenhouse gas is valid, and human activity is creating a blip on top of the natural effects that could be dangerous. My feeling is that if there is any chance that we can influence the climate by reducing CO₂ we should pursue it on the basis of the "precautionary principle", though it may well prove to be a waste of effort – too little too late. Whether now or a bit later, humanity will have to learn to live sustainably, as we are rapidly exhausting the resources of the planet, so why not curtail the burning of fossil fuels and desecration of forests ASAP? And whether or not CO₂ is forcing climate change, change is obviously occurring, and if it reaches a tipping point any time soon, the argument will have been academic.

Noel Young

IPCC = Intergovernmental Panel on Climate Change

mya = million years ago

Myall Lakes, September 2008

Tony Morton

A family stay right on the lakeside produced a couple of encounters that might interest members. Several times a day, the verandah of our 'Villa' was inspected by a pair of Radjah Shelduck in search of sustenance. They were very tame, and seemed to be the senior ducks in the area, energetically seeing off the Black Ducks whenever one of the latter approached too close. What were they doing just an hour north of Newcastle? Their range seems to be far more tropical NE Australia. Perhaps they had escaped from somewhere.

There is a small car ferry close by. It operates every half-hour during the day. The crossing from Bombah Point takes five minutes. Under the ramps that allow cars to embark and disembark, Welcome Swallows had built their nests. At all times, even during crossings, you could see the birds zooming under this metal flange, often staying there to feed the chicks. I imagine they took the site to be a moving cave or rock! They'd certainly be safer there from Goannas, of which there were plenty about.

The forest was thick and magnificent. I recognized only a few species, I'm ashamed to say, and the resort didn't have much in the way of information for the natural philosopher. The dominant tree round the lakes seemed to be *Angophora costata*, some enormous, some hugged by massive Staghorn ferns, with much *Casuarina* and *Banksia*. I noticed two species of *Ghania* (so the local subspecies of Sword-grass Brown butterfly is catered for, and, indeed, I did see a few). There was a rich understorey of which the species I recognized were *Dionella*, *Acacia*, *Leptospermum*, *Lomandra*, *Kennedia*. Lots of *Poa*, too. The

main part of the resort had replaced a small patch of rain-forest that had previously existed there, but there were still some gigantic fig-trees, and a 'Bush Plum', which tasted quite nice. There are other patches of rain-forest here and there in the area, all having existed from time immemorial, I imagine, and all probably treasure houses for the naturalist.

I saw (without effort – there must be many others) the following birds, apart from the two mentioned above: Brush-turkey, Pelicans, Darter, Pied Cormorant, Little Black Cormorant, Pacific Duck, White-bellied Sea-eagle, Scaly-breasted Lorikeet, Variegated Fairy-wren, Blue-faced Honeyeater, Noisy Miner, Black Currawong.

Butterflies were few and far between, even in the rain-forest patches. It may have been too early in the year for the forest species, but I was surprised not to see any Skippers. Perhaps I got up too late! Species seen were: Orchard Swallowtail, Blue Triangle, Imperial Jezebel, Black Jezebel, Evening Brown, Orange-streaked Ringlet, Brown Ringlet, Varied Sword-grass Brown, Common Brown, Australian Painted Lady, Dark Pencil-blue, Yellow-spotted Blue, Large Purple Line-blue, Two-spotted Line-blue, Fringed Heath-blue. (No, I don't like the new common names either!)

A Book Review

Chris Timewell

Marriott, Peter (2008), *Moths of Victoria. Part 1 Silk Moths and Allies, Bombycoidea*. Published by the Entomological Society of Victoria (including 32 page book and accompanying CD). \$10 plus postage and handling direct from the ESV.

Despite having a relatively poor reputation broadly across society, native moths are increasingly being embraced by amateur naturalists as a worthy area of interest, extending from the local level (for example, Tony Mortons informative article "A Moth Beginner" in Vol. 32.7 of the *Castlemaine Naturalist*) through to the national level (e.g. Zborowski and Edwards, 2007, 'A Guide to Australian Moths', CSIRO Publishing, Collingwood.). This latter book is comprehensive, visually impressive and easy-to-use guide for those wishing to identify a moth down to the family-level and learn about typical biological characteristics of the majority of moth families found in Australia. However, with an estimated 20 000 to 30 000 species occurring nationwide, their guidebook could only ever hope to show a few examples of each of the 60+ moth families.

Enter Peter Marriott and the Entomological Society of Victoria (ESV). One of the stated aims of the ESV is *to compile a comprehensive list of all Victorian insect species*. Peter Marriot, an enthusiastic and renowned amateur lepidopterist and the current president of the ESV, is leading the charge with this fine work on the moth species occurring within Victoria. This book and CD are the first of a planned five part series that aims to not only list every one of Victoria's moth species, but provide photographs and other information as well. This is no simple feat. As John Landy identifies in his praiseful and knowledgeable foreword, there are over 2000 known moth species known to occur in Victoria, with many others yet to be discovered or described.

Part 1 of the series covers the superfamily Bombycoidea, which typically are “*hairy moths and the males have feathery antennae which are used to detect females.*” Within this superfamily are the snout moths (family Lasiocampidae – 39 species occurring in Victoria), the anthelids (Anthelidae – 32+ sp.), the bag moths (Eupterotidae – 1 sp.), the introduced domesticated silk worm (Bombycidae – 1 sp.), the Emperor Moths (Saturniidae – 2 sp. (possibly 3)) and the hawk moths (Sphinidae – 9 sp.). Peter’s vast knowledge of Victoria’s moth fauna comes to the fore here, as a number of the moths presented are ‘apparently undescribed’ in the scientific literature without a formal binomial latin name.

The book contains over 200 accompanying high quality colour photographs of various moth life forms, including pinned specimens (with both sexes shown where there are notable differences), living adults in their natural environment, caterpillars, cocoons and eggs. At least one photo of an adult moth is included for each species. A short description is also provided for each family of moths. While the book in itself is an impressive achievement, the information contained within the accompanying CD is truly astounding. The CD contains another 130 pages of details on the Bombycoidea. For each moth species the CD contains high-resolution photos of pinned male and female specimens (where available), Victorian distribution maps, times of the year when adults are in flight, a brief description of its Australia-wide distribution, a list of larval food plants and other useful and interesting information. This information has been compiled from government collections (mainly the Melbourne Museum and the Australian National Insect Collection at CSIRO in Canberra), from Marriott’s own extensive collection and from other major private collections. Amongst the vast array of information provided on the CD is the interesting story of *Athela guenei*. The type specimen for this Anthelid moth species, and probably the only individual ever collected in the state, is thought to be from the Mt Alexander Range near Castlemaine, collected by T. R. Oxley between 1852 and 1855.

My only quibble with the CD is the lack of a central interface page. With over 100+ separate PDF files on the CD, each displaying 1 or 2 pages of information, it was a little bit cumbersome to navigate. A central home page with links to all other pages would have been useful, but was not essential as the author also provides permission for the user to print out relevant pages for their personal use, which is something I will certainly be doing in the near future.

Overall, Peter and the ESV should be congratulated. The book and CD will be of interest to both the casual observer through to avid collectors, and at \$10 is extremely good value. I recommend it to all.

A Reminder

Subscriptions for 2009 are still outstanding for some members.
If your envelope has a red mark, please attend to this ASAP

VALE KEN CROSS

Ken Cross died on 1st April, 2009, aged 76. He grew up in the Western District and spent his early youth there. Ken moved around various parts of Victoria in his career first as a bank officer and in his later career as first a Methodist minister and then a Uniting Church minister. In retirement he and Marjorie settled in Mount Macedon, then moved to Gisborne. During their Macedon years they were active members of CFNC. Ken will be sadly missed.

Natalie de Maccus

Observations

- ◆ One or two White naped and Brown headed Honeyeaters seen now every 2 or 3 days (not the usual numbers); 2 Eagles over Happy Valley; heaps of birds Easter Sunday at Gunbower Is., including Brown Goshawk, Gilberts Whistler and Sittellas – Denis Hurley
- ◆ Recently counted my local records over 20 years and have recorded 105 bird species within 2 km of the house – Nigel Harland
- ◆ A Grey Butcherbird, and Swift Parrots (six) seen at the Golf Course mid April, where Grey Box is in full flower - Debbie Worland
- ◆ While checking area to be control burned at Smiths Reef, noted Autumn Greenhood, Red tipped Greenhood, Midge Orchid, Parsons Bands and Tall Greenhood (not flowering) – Richard Piesse
- ◆ A Grey Shrike Thrush and some wrens about, and we have Sulphur Crested Cockatoos slowly devouring the house – Chris Morris
- ◆ And more marauding SC Cockatoos have knocked all the pears off the tree, and are attacking next door's walnuts – Natalie de Maccus

Swift Parrot survey - spotters needed

Its time do that official count of Swift Parrots in our area for the national survey on **16th and 17th of MAY.** Keep an eye out for Regent Parrots too(!) If you can help, please contact Debbie Worland - 5472 2474

Disclaimer: The opinions expressed in this newsletter are those of the contributors and not necessarily those of the club

Castlemaine Field Naturalists Programme

May 2009

Fri May 8th meeting: DAVID HOLLANDS on Owls and other night birds

Sat May 9th field trip: Gowar School and Smiths Reef

Fri June 12th meeting: SIMON KENNEDY on Swift Parrot research

Sat June 13th field trip: To be announced

Fri July 10th meeting: GEOFF NEVILL Threatened species (Orchids)

VISITORS ARE WELCOME AT CLUB ACTIVITIES

General meetings - (second Friday of each month, except January) are held in the Uniting Church (UCA) Hall (enter from Lyttleton St.) at 8.00 pm.

Field Trips - (Saturday following the general meeting) leave from the car park opposite Castle Motel, Duke Street at 1.30pm sharp unless stated otherwise. BYO morning and/or afternoon tea. Outdoor excursions are likely to be cancelled in extreme weather conditions. There are NO excursions on total fire ban days.

Business meetings - fourth Thursday of each month, except December, at Natalies; 65 Johnstone Street, at 7.30 pm. All members are invited to attend.

Subscriptions for 2009

Ordinary membership: Single \$27, Family \$35

Pensioner or student: Single \$24, Family \$29

Subscription includes postage of the monthly newsletter, Castlemaine Naturalist

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